

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application.

COMPLETE LISTING OF THE CLAIMS:

Claims 1-4 : (Canceled)

Claim 5 : (New) A phase error detector for generating a phase correction signal to correct a phase difference between a reference frequency of a voltage-controlled oscillator and a carrier frequency of a received signal which is received by a quadrature-amplitude modulated (QAM) receiver, the phase correction signal having a zero-crossing locking point, the received signal having in-phase components and quadrature components in a plurality of decision regions, the detector comprising: a plurality of different algorithms arranged in an order; and the detector being operative for successively executing the algorithms in the order, for each of the decision regions, until the phase correction signal having no additional zero-crossing points is generated.

Claim 6 : (New) The phase error detector of claim 5, wherein the detector is operative for executing different ones of the plurality of algorithms for all of the plurality of decision regions.

Claim 7 : (New) The phase error detector of claim 5, wherein the order of the algorithms is:

$$S1 = FQ f(ZI) - FI f(ZQ)$$

$$S2 = \pm 2 FQ f(ZI)$$

$$S3 = \pm 2 FI f(ZQ)$$

$$S4 = \pm 2 ZI ZQ$$

$$S5 = 0$$

in which $S1, S2, S3, S4, S5$ are different phase correction signals, in which ZI and ZQ are the in-phase and quadrature-phase components of the received signal, in which FI and FQ are offsets of ZI and ZQ , in which $f(ZI) = ZI$ or $\text{sign}(ZI)$, and $f(ZQ) = ZQ$ or $\text{sign}(ZQ)$.